SAMPLE PRESENTATIONS OF ENVIRONMENTAL APPRAISALS

Approach: Assessment and Scoring (from a case study flood control in Bangladesh)

The project assessment of specific IECs was carried out by individual EIA team members whose expertise was relevant to the IECs assessed. In order to perform assessment within a uniform format and criteria, the concepts of sustainability and reversibility were defined and the assessment scoring was allocated following a defined and stepwise structure. Assessment and scoring were performed on predicted (quantified or qualitative) impacts of the project on specified and individual IECs. The results are presented in Working Aid 12-1 (simplified visualisation), 12-2 (detailed table) and 12.3 (adjusted after 2 years of implementation). Examples from other case studies are in WA 12-4 to -10.

- Sustainablity (applied to positive impacts only): sustainable, sustainable with mitigation or non-sustainable.
- Reversibility (applied to negative impacts only): irreversible,reversible with mitigation,reversible
- Sensitivity (readiness with which an IEC receive an impact): sensitive or less sensitive.
- Magnitude (size of impact): high vs. low, can be negative or positive. Any quantifiable increase or decrease to an IEC was converted to percentage values. Any direct threat to human life, endangered species or environmentally sensitive areas was considered high magnitude.
- Rate: immediate or gradual. Immediate refers to an impact that is effective within one year of action; otherwise the impact was considered gradual.

Procedure: (1) IECs were grouped (example Figure 12). (2) Impacts of project actions on the IECs ere assessed sequentially to differentiate between cause and effect.. (3) Changes to IECs expected over time without the project were assessed, quantified where possible in terms of areas gained or lost, or tons/year gained or lost, and the changes converted into percentages. (4) The gains or losses as a result of project impacts were assessed at two levels of comparison - against the present baseline condition, and against the future likely levels in the absence of the project. The latter comparison, i.e. between future-without-project and future-with-project, is the defined measure of impact. (5) Mitigation measures were recommended to reduce the effects of the impact in the case of negative impacts, and enhancement measures were recommended to increase the benefits in the case of beneficial impacts on IECs. Scoring of impacts can be performed with or/and without mitigation measures (see Working Aid 12-1)

Criteria for scoring impacts (example from Bangladesh, FAP 16/19. 1992)

positive/beneficial impact		negative/adverse impact	
sustainable		*irreversible*	
less sensitive			
high magnitude, immediate	+4	high magnitude, immediate	-3.5
high magnitude, gradual	+3.5	high magnitude, gradual	-2.5
low magnitude, immediate	+2	high magnitude, immediate	-2
low magnitude, gradual	+0.5	low magnitude, gradual	-1.5
sensitive			
high magnitude, immediate	+5	high magnitude, immediate	-5
high magnitude, gradual	+4	high magnitude, gradual	-4
low magnitude, immediate	+3.5	high magnitude, immediate	-3.5
low magnitude, gradual	+1.5	low magnitude, gradual	-2.5
non-sustainable		*reversible*	
sensitivity does not apply		*less sensitive*	
high magnitude, immediate	+2	high magnitude, immediate	-1.5
high magnitude, gradual	+1.5	high magnitude, gradual	-1
low magnitude, immediate	+1	high magnitude, immediate	-0.5
low magnitude, gradual	+0.5	low magnitude, gradual	-0.5
		sensitive	
		high magnitude, immediate	-2.5
		high magnitude, gradual	-1.5
		high magnitude, immediate	-1
		low magnitude, gradual	-0.5

SAMPLE PRESENTATIONS OF ENVIRONMENTAL APPRAISALS

Example 1: Holistic appraisal of flood control in Bangladesh: Sirajang Compartmentalisation Pilot Project (CPP)

Source: FAP 20 (1993)

Environmental elements	Extra project impact: Beneficial (high / medium / minor)	Extra project impact: Adverse (minor / medium / high)	Mitigation costs	Type of impact
Regular flooding of cropland	←		—	R,IM
Flood hazards (off-site)		→	high	R,IM
Homestead damage (floods)				
- housing	←		—	R,IM
- gardens, trees	←		—	R,IM
Containment of breach-floods	on-site ←	→ off-site	—	R,IM
Rural flooding hazard	←			
Drainage congestion	←		—	R,IM
Groundwater availability		→	high	R,LT
Surface water quality		→ ?	medium	ID,R,LT
Groundwater quality		→ ?	medium	R,LT
Soil fertility status		→ ?	medium	ID,R,LT
Soil physical status		→ ?	medium	ID,R,LT
Aquatic habitat status				
- monsoon		→	high	R,IM
- pre-monsoon		→	high	R,IM
Terrestrial habitat status	←		—	R,IM
Wildlife (migratory)		→ ?	medium	R,LT
Biological imbalances		→	medium	ID,R,LT
Capture fisheries		→	high	R?,IM
Culture fisheries	←		medium	R,IM
Crop production	←		—	ID,R,LT
Crop diversity	←		—	ID,R,LT
Biomass energy shortage	←		low	ID,R,LT
Fodder production	←		low	ID,R,LT
Communicable diseases				
- water-based	←		medium	ID,LT
- vector-borne	←		medium	ID,LT
Non-communicable diseases				
- occupational risks		→	medium	IR,IM
- water pollution	←	→	medium	ID,LT
Navigation		→	high	IR,IM
Road comminication	←		—	ID,LT
Construction impacts				
- pollution/spillages		→	medium	ID,IM
- land aquisition		→	high	ID,IM
Waste pollution (rural areas)				
- solid wastes	←		medium	ID,LT
- liquid wastes	←		medium	ID,LT

Tpye of impact: IM - immediate, ID - indirect, LT - long term. R - reversible. IR - irrversible (reasonable time and cost)

Some positive impacts can only realize if the environmental management plan (see Figure 16) will be implemented

SAMPLE PRESENTATIONS OF ENVIRONMENTAL APPRAISALS

Example 2: Detailed summary table of EIA. Tangail flood control Compartmentalisation Pilot Project (CPP). Bangladesh

Source: FAP 16/19.1992

Important Environmental Components	Present Amounts	Impact of CPP	Type of Impact[1]	Impact Rating[2]
Land Types				
F_0	576 ha	+1896 ha	SM/HM	+2.5
F_1	1821 ha	+1085 ha	SM/HM	+2.5
F_2	4248 ha	-787 ha	SM/LM	+1.0
F_3	2552 ha	-2194 ha	SM/HM	+2.5
Drainage Congested Areas	1549 ha	Decrease	SM/LM	+1.5
Ground Water	Adequate	Decrease in dry years	RM/LM	-0.5
Annual Crop Production				
Total area irrigated	5398 ha	+376 ha	SM/LM	+1.5
Total potential paddy production	37,551 tonnes	+3276 tonnes	SM/LM	+0.5
Total paddy production	34,376 tonnes	+8077 tonnes	SM/HM	+3.0
Total production lost to crop damage	-3175 tonnes	+4801 tonnes	SM/HM	+3.0
Total rabi production	7751 tonnes	+1579 tonnes	SM/HM	+1.5
Total jute production	2947 tonnes	+1920 tonnes	SM/HM	+1.5
Crop diversity	1:2.1	Decrease	RM/LM	-1.5
Cropping intensity	196 %	+18 %	SM/LM	+0.5
Total farm labor	3,011,000 person/-days	+292,000 person/days	SM/HM	+1.5
Homesteads				
Housing	1751 ha	+175 ha	SM/LM	+0.5
Garden crops	875 ha	+87 ha	SM/LM	+0.5
Tree crops	875 ha	+87 ha	SM/LM	+0.5
Homestead vegetation damage	-20 %	+20 %	SM/HM	+3.0
Biomass Energy Shortage	-52 %	+50 %	SM/HM	+3.0

[1] SM = sustainable with mitigation, S = sustainable, RM = reversible with mitigation, IR = irreversible; HM = high magnitude, LM = low magnitude

[2] Highest beneficial impact = +5.0, maximum negative impact = -5.0

Working Aid 12-2 cont.

Important Environmental Components	Present Amounts	Impact of CPP	Type of Impact[1]	Impact Rating[2]
Capture Fisheries				
Annual production	380 tonnes	-32 tonnes	IR/LM	-3.5
Professional fisherman household production	720 kg/year	Decrease	IR/LM	-3.5
Subsistence fisherman household production	8 kg/year	Decrease	IR/LM	-3.5
Fish diversity	56 species	-23 species	IR/HM	-5.0
Culture Fisheries		0		
Annual production	49 tonnes	+16 tonnes	SM/HM	+1.5
Total Employment	NQ	Larger increase	SM/LM	+1.5
Aquatic Habitat				
Pre-monsoon	322 ha	+1875	SM/HM	+1.5
Monsoon	7138 ha	-1130	RM/HM	-1.5
Post-monsoon with drainage congestion	8145 ha	-1521	RM/HM	-1.5
Post-monsoon without drainage congestion	697 ha	+118	SM/LM	+1.0
Terrestrial Habitat				
Pre-monsoon	12,678 ha	-1875	RM/HM	-1.5
Monsoon	5862 ha	+1130	SM/HM	+1.5
Post-monsoon with drainage congestion	4855 ha	+1521	SM/HM	+1.5
Post-monsoon without drainage congestion	12,303 ha	-118	RM/LM	-0.5
Wildlife				
Presently endangered	7 species	2 species will become extinct	IR/HM	-5.0
Presently threatened	10 species	4 species will decline	RM/HM	-3.0
Presently common	29 species	13 species will decline	RM/HM	-3.0
Pesticide contamination	Prevalent	Increase	RM/HM	-3.0

Continued

Working Aid 12-2 cont.

Important Environmental Components	Present Amounts	Impact of CPP	Type of Impact[1]	Impact Rating[2]
Road communication	262 km	Improved	S/LM	+0.5
Navigation				
Passengers	245,000 annual trips	Likely decrease	RM/HM	-2.5
Goods	900 tonnes annually	Small decrease	RM/LM	-0.5
Socio-economic				
Subsistence fishing	2.6-3.5 kg/hh/-year	Decrease	IR/LM	-3.5
Crop production, annual wages				
Peak season	135.5 million taka	+44 million taka	SM/HM	+3.0
Lean season	90.3 million taka	+29 million taka	SM/HM	+3.0
Construction employment	Nil	+9533 person/yrs	NS/HM	+2.0
O & M employment	Nil	+580 jobs	SM/LM	+1.5
Quality of life				
Gender issues	NQ	Improved	SM/LM	+1.0
General Health	NQ	Improved	SM/HM	+3.0
Nutrition-crop based	NQ	Improved	SM/HM	+1.5
Nutrition-fish based	NQ	Decrease	IR/HM	-3.5
Vector-borne disease incidence	NQ	Increase	RM/HM	-1.5
Tangail Town				
Drinking Water	High iron and manganese	Deteriorates	RM/LM	-0.5
Ground water depletion	0.25m/yr	Decrease	IR/LM	-1.5
Flooding hazard	High risk	Decrease	SM/HM	+3.0
Drainage problems	Prevalent	Decrease	SM/LM	+1.0
Rural flooding hazard	Prevalent	Decrease	SM/LM	+2.5

SAMPLE PRESENTATIONS OF ENVIRONMENTAL APPRAISALS

Example 3: Assessment of environmental impacts for alternative developments of a flood control project (Surma-Kushiyara. Bangladesh FAP 16 (1992)

Resource Group	Important Environmental Component	Option 2 - Full Flood Protection		Option 3 - Subm. Embankments	
		W/o Mitigation	With Mitigation	W/o Mitigation	With Mitigation
Aquatic Resources					
Wetlands	Permanent wetland surface area	+2	+2	+1	+1
	Seasonal wetland surface area	-2	-2	0	0
	Benthic/plankton diversity/abundance	-2	0	0	0
	Macrophyte diversity and abundance	-3	-2	0	0
	Critical habitat for endangered spp.	-2	0	-1	0
Capture Fisheries	Major carp abundance/production	-4	-3	-3	-2
	Minor spp. abundance/production	-3	-2	-2	-1
	Fish species diversity	-3	-2	-2	-1
	Fish disease incidence	-3	-3	-1	-1
Culture Fisheries	Fish production	+2	+4	0	0
Wildlife	Wetland habitat diversity	-3	-3	0	0
	Wetland species diversity	-3	-3	0	0
Land Resources					
Agriculture	Dry season soil moisture	0	0	+3	+3
	Land type ratio	+3	+3	0	0
	Soil fertility	-2	0	-1	0
	Soil drainage	+3	+3	0	0
	Cropping patterns	+2	+3	+1	+1
	Cropping intensity	+4	+5	0	0
	Cropping yields	+4	+5	+2	+3

Continued

Working Aid 12-3 cont.

Resource Group	Important Environmental Component	Option 2 - Full Flood Protection		Option 3 Emban
		W/o Mitigation	With Mitigation	W/o Mitigation
Land Resources (continued)				
Agriculture (continued)	Crop damage	+4	+4	+1
	Crop diversity	0	0	0
	Livestock abundance and diversity	+2	+3	+1
	Feed and fodder quantity and quality	+2	+3	+1
Vegetation Resources	Natural vegetation	+2	+2	+1
	Homestead veg. abundance	+3	+4	+2
	Species diversity	0	+2	+1
	Fuelwood abundance	+3	+4	+1
Wildlife	Terrestrial habitat abundance	+4	+4	0
	Terrestrial habitat diversity	+1	+2	0
	Wildlife species diversity/abundance	+2	+3	0
	Commercially valuable wildlife	+1	+1	0
	Wildlife pests	-3	-2	-1
Human Resources				
Household Damage	Damage inside embanked area	+5	+5	+2
	Damage outside embanked area	-4	-2	-2
	Flood hazards	+3	+4	0
Employment	Local employment - agriculture	+3	+3	+3
	Local employment - fisheries	-2	-1	0
	Total income generation	+3	+3	+2

SAMPLE PRESENTATIONS OF ENVIRONMENTAL APPRAISALS

Example 4: Summary of environmental impacts for an unmitigated project (Bhelumia-Beduria. Bangladesh)

from FAP 16.1994

Important Environmental Component	Present Amount or Frequency	Project Impact*	Impact Type†	Impact Rating‡
Tidal flooding	Daily in monsoon season	Slower flood rise, rapid dissipation	EILM	+2
Storm surge	Annual, multiple in some years	Eliminate average surges	SIHM	+7
Land drainage	Extensive over project area	Reduce or eliminate over 80% congested area	SGHM	+5
Groundwater	Drinking purposes only	Negligible	-	0
River erosion and shifting	Extensive migration of river shorelines, possibly declining in rate	Negligible, shifting river channel may erode embankment	-	0
Land types			Nil or SIHS	0 or +7
F_0	287 ha	Nil (Scenario 1) or +1,026 ha (Scenario 2)		
F_1	4,061 ha	Nil (Scenario 1) or -912 ha (Scenario 2)		
F_2	129 ha	Nil (Scenario 1) or -114 ha (Scenario 2)		
Soil quality	Moderately fertile, suitable for crop production	1. Reduction in nutrient sediment deposition	SGLR	-2
		2. Reduction in saline tidal flushing in SE	EGLS	+2
Agricultural production				
Irrigated area	≈13% cultivable area irrigated	≈5% increase in irrigated area	EGLM	+2
Crop damage	≈4,350 tonnes lost annually to floods & pests	65% reduction	SGHM	+5
Crop production	≈23,000 tonnes annually	≈17% (Scenario 1) or 19% (Scenario 2) increase	SGHM	+5
Homestead vegetation				
Homestead forests	≈400 ha	Improvements in cover and species diversity	SGLS	+4
Homestead gardens	≈50 ha	Improvements in species diversity and production	SGLS	+4
Biomass energy	≈16,000 tonnes available annually	Increase in fuel wood and crop residues	EGHS	+4
Homestead land	760 ha	Some loss to embankment possible	EGLV	-2

* Project impact is the difference between effects produced by the project and anticipated long-term changes in the absence of the project.
† Sensitive (S) or less sensitive (E) resource; immediate (I) or gradual (G) impact onset; high (H) or low (L) impact magnitude; beneficial impacts may be sustainable (S), sustainable with mitigation (M) or not sustainable (N); negative impacts may be irreversible (I), reversible with mitigation (V), or reversible (R).
‡ Impact ratings are given in Annex 2.
** No impact expected by project, but project itself may be impacted.

Important Environmental Component	Present Amount or Frequency	Project Impact*	Impact Type†	Impact Rating‡
Wildlife				
Endangered species	5 species	Negligible	-	0
Threatened species	7 species	Negligible	-	0
Pest species	Abundant (rats, granivorous birds)	Increased populations and damage levels	SGHR	-3
Commercial species	Turtles: 4-5 tonnes annual production	Negligible	-	0
Pesticide contamination	No information	Likely to increase in food chain concentrations	SGHR	-2
Capture fisheries				
Fish habitats	Extensive	Decline in quality within project area	SGLR	-2
Fish diversity	61 species	Probably negligible	-	0
Annual harvests	≈2,600 tonnes	10-15% decline inside area 3-4% overall	SGHV	-3
Fishing costs and inputs	Nominal	Increase in costs, decrease in security	SIHV	-7
Pesticide contamination	No information	Likely increase in food chain concentrations	SGLV	-3
Water quality	Moderately good	Slight decline	EGLV	-2
Culture fisheries				
Ponds	1,654	Slight increase	EGLS	+2
Annual production	≈455 tonnes	Slight increase	EGLS	+2
Water quality	Moderately good	Slight decline	EGLV	-2
Local employment				
Agricultural	1,386,000 person-days annually	1-3% increase	EGLS	+2
Fishing	≈20% households reliant on fishing	Sharp decline if river access is blocked	SIHV	-7
Household income				
Large landowners	≈11% population own 70% land	Improved	EGHS	+4

* Project impact is the difference between effects produced by the project and anticipated long-term changes in the absence of the project.
† Sensitive (S) or less sensitive (E) resource; immediate (I) or gradual (G) impact onset; high (H) or low (L) impact magnitude; beneficial impacts may be sustainable (S), sustainable with mitigation (M) or not sustainable (N); negative impacts may be irreversible (I), reversible with mitigation (V), or reversible (R).
‡ Impact ratings are given in Annex 2.
** No impact expected by project, but project itself may be impacted.

Example 5: Rapid environmental appraisal of technical options. Case study flood control in Sirajang. Bangladesh

Source: FAP 20. 1993

Environmental Elements	OPTION-1	OPTION-2A	OPTION-2B
Containment of BRE-Breach Flood	+1	+4	+4
Regular Flooding of Croplands	+3	+2	+1
Drainage Improvement	+3	+2	+2
Groundwater Availability	-1	-2	-2
Soil Fertility Maintenance	-1	-2	-2
Surface Water Quality	?	?	?
Groundwater Quality	?	-1	-1
Aquatic Habitat Status	0	-2	-3
Wildlife Threat	-1	-2	-3
Terrestrial Habitat Status	+1	+2	+2
Biological Imbalances	-1	-2	-3
Capture Fisheries	-1	-2	-3
Culture Fisheries	0	0	0
Crop Diversification	+1	+1	+1
Crop Intensification	-1	-2	-2
Crop Production	+1	+2	+2
Homestead Plantation	0	0	0
Embankment Plantation	0	0	0
Biomass Energy Availability	0	-1	-2
Fodder Production	0	-1	-2
Communicable Diseases			
Water-based	0	0	0
Vector-borne	0	0	0
Non-Communicable Diseases			
Occupational Risks	-1	-2	-2
Water Pollution/Sanitation	0	0	0
Construction Impacts			
Land Aquisition/Losses	-1	-2	-4
Building Materials	-1	-3	-4
Pollution/Spillages	-2	-3	-4
External Impacts of Contained Rivers	0	-3	-5
Overall Index	Minor Impacts	Medium Impacts	Major Impacts

Scoring system = +5 to -5

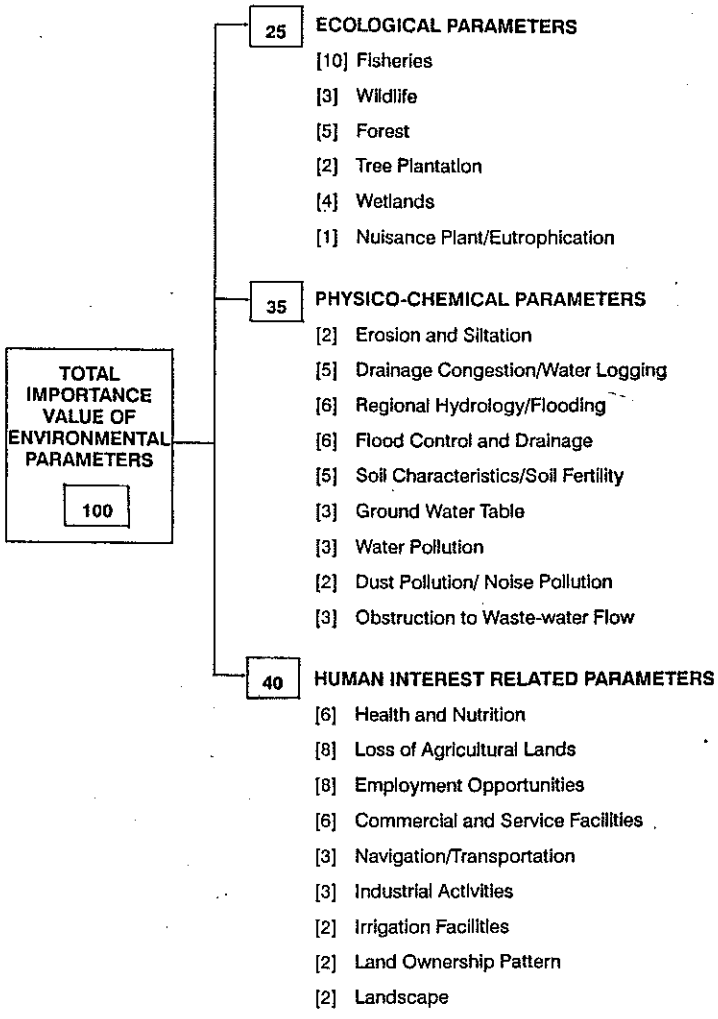
SAMPLE PRESENTATIONS OF ENVIRONMENTAL APPRAISALS

Example 6: Initial environmental appraisal rural road project. Thana Road Project, Bangladesh (adapted from: Local Government Engineering Department.1992. Dhaka)

1. Quantification of environmental impact

Environmental issues are grouped under three components: ecological, physico-chemical and human issues. Relevant parameters were selected for examination, e.g. fisheries, forest, plantation (see tables).

The EIA rated beneficial and negative impacts are on a 11-point scale: no change has 0 value; negative impacts are rated -5 to -1 as severe/high/moderate/low very low negative; beneficial impacts are rated accordingly from +1 to +5 as very low positive to very high positive. The relative importance of values of environmental parameters applicable for rural infrastructure projects have been based on prevailing environmental concerns in Bangladesh (ratings were set by the executing engineering department):



[ ] Parameter Values
☐ Total and Component Values

ENVIRONMENTAL PARAMETERS	INITIAL ENVIRONMENTAL EXAMINATION				
	Positive Impact	No Impact	Adverse Impact		
			Low	Mode-rate	Severe
I. ECOLOGICAL					
Fisheries	☐	☐	☑	☐	☐
Forest	☐	☑	☐	☐	☐
Tree Plantation	☑	☐	☐	☐	☐
Wetland/Wetland Habitat	☐	☑	☐	☐	☐
Nuisance Plant/Eutrophication	☐	☐	☑	☐	☐
	☐	☐	☐	☐	☐
II. PHYSICO-CHEMICAL					
Erosion and Siltation	☐	☐	☑	☐	☐
Regional Hydrology/Flooding	☐	☐	☑	☐	☐
Drainage Congestion/Water logging	☐	☐	☑	☐	☐
Obstruction to Waste Water Flow	☐	☑	☐	☐	☐
Dust Pollution/Noise Pollution	☐	☑	☐	☐	☐
	☐	☐	☐	☐	☐
III. HUMAN INTEREST					
Loss of Agricultural Lands	☐	☐	☐	☑	☐
Employment Opportunities	☑	☐	☐	☐	☐
Navigation/Boat Communication	☐	☐	☐	☑	☐
Commercial and Service Facilites	☑	☐	☐	☐	☐
Industrial Activities	☑	☐	☐	☐	☐
Irrigation Facilities	☑	☐	☐	☐	☐
Landscape	☐	☐	☑	☐	☐
	☐	☐	☐	☐	☐

2. Case Study Thana Road Project. Rating of impacts. Initial EIA examination

ENVIRONMENTAL PARAMETERS	Relative Importance Value	Degree of Impact	Relative Impact		EIV
			Positive	Negative	
I. ECOLOGICAL					-19
Fisheries	10	-2		-20	
Forest	5	0			
Tree Plantation	2	+ 1	+ 2		
Wetland/Wetland Habitat	4	0			
Nuisance Plant/Eutrophication	1	-1		-1	
II. PHYSICO-CHEMICAL					-13
Erosion and Siltation	2	-1		-2	
Regional Hydrology/Flooding	6	-1		-6	
Drainage Congestion/Water logging	5	-1		-5	
Obstruction to Waste Water Flow	3	0			
Dust Pollution/Noise Pollution	2	0			
III. HUMAN INTEREST					+ 27
Loss of Agricultural Lands	8	+ 3		-24	
Employment Opportunities	8	+ 4	+ 32		
Navigation/Boat Communication	3	-3		-9	
Commercial and Service Facilites	6	+ 3	+ 18		
Industrial Activities	3	+ 2	+ 6		
Irrigation Facilities	2	+ 3	+ 6		
Landscape	2	-1		-2	
Total Environmental Impact Value			**+ 64**	**-69**	**-5**

Example 7: Summarising description of environmental impacts. Okavango Integrated Water Resources Development, Botswana. adapted from SMEC 1987

SCHEME: MAUN RESERVOIR

ASPECTS	DIRECT IMPACTS	INDIRECT IMPACTS	MITIGATING ACTIONS	RESIDUAL IMPACTS
PLANT COMMUNITIES	- Loss of some riparian vegetation primarily below the Boteti junction. - Probable loss of Phragmites beds in the first 5-6 km above Samedupi.	- Minor changes in ground water tables in vicinity of reservoir margins. - Extensive areas above damsite suitable for submerged weed growth which may require controls in selected areas.	- Possibilities limited to bunding to preserve riparian fringe and planting of suitable species in areas requiring erosion protection (eg north banks Nhabe River).	- Projected losses environmentally acceptable in term of overall development benefits.
WILDLIFE	- Limited adverse effects but probable increase in crocodile and hippo populations. - Management effects on Maun Educational Wildlife Park.	- Predation of fish by crocodiles if not controlled. - Potential conflicts between hippos and crocodiles and recreational use.	- Controls on crocodile and hippo populations by culling or removal. - Extension of Maun Wildlife Sanctuary to cover central reservoir zone.	- Benefits resulting from Wildlife accruing to tourism.
FISHERIES	- Substantial actual benefits from reservoirs estimated at 190 tonnes/year net yield.	- Increased predation of breeding stock and fingerlings in lagoons that become isolated by drawdown.	- Funding required in initial years of impoundment for fisheries research for management plan for fishery.	- Benefits of estimated P580,000/year for commercial, recreational and domestic fishing by local communities.
BIRDLIFE	- Increased feeding and some breeding habitat for wetland species and opportunistic feeding by others (eg fish predators). - Minor losses in terms of riverine habitat in proximity to Samedupi, both trees and phragmites beds.	- General improvement for selected resident bird population due to presence of reservoirs. (eg waders and waterfowl).	- Leave some standing trees in areas to be inundated as refuge for species such as darters, cormorants, eagles.	- General overall benefits to increased diversity and density of birdlife. - Loss of riparian habitat important as a scarce resource.
MEDICO-ECOLOGICAL	- Increased extension in periods and suitable breeding habitat for mosquito vectors for malaria. - Increased suitable habitat for snail species intermediate hosts for both types of schistosomiasis	- Risk situation in Maun area for increased gastro enteric diseases. - Increased water contact will probably result in consolidation of urinary schistosomiasis in long term.	- Funds required for comprehensive medico-ecological surveys and required preventative and control programmes. - High priority must be given to improvement to water supply and sanitation in Maun area.	- Increased (but controllable) prevalence of schistosomias and malaria with proper public health scheme.
LAND USE AND RESERVOIR MANAGEMENT	- Losses in communal riverbed grazing and 160 ha molapo farming flood plains (eg 35 families affected). - Good potential for use of drawdown zone and fringe areas for small-scale farming.	- Water quality degradation particularly in vicinity Nhabe irrigation could occur due to residual agricultural chemicals. - Maun area also could experience high nutrient inflows.	- Detailed pre-impoundment studies on land status, removal of fencing, planning for recreational use and controls on use of land and reservoir required. - Water quality monitoring programme required.	- Potentials for use of drawdown area should be realised to minimise effects on traditional users. - Programme to assist direct users of water for domestic purposes recommended.
TOURISM/SAFARI OPERATIONS AND RECREATIONAL USE	- Benefits to existing operations will mitigate adverse effects of lower Boro scheme. - New opportunities for expanded Maun tourism base will occur estimated at P200,000/year. - Extensive benefits to local residents for day use recreation.	- Minor but important risk to recreational users from schistosomiasis particularly tourists. - Economic benefits to Maun business through increased tourism.	- Zoning and controls of recreational use required to maximise other uses (eg drawdown agriculture).	- Significant benefits to integral component of Delta's tourism with annual value estimated at about P200,000/year.

Example 8: Holistic view of environmental impacts. Sewerage recycling project, Palestine.

from GTZ 1992.2

Environmental Components	*without project*	*waste plant*		*pipeline*		*reservoir*	*wastewater irrigation*
		constr.	*operation*	*constr.*	*operation*		
Humans/Settlements	-	-	+	-	o	o	+
settlements	-	o	+	o	o	o	o
agricultural use	-	-	+	-	o	o	+
waste emissions	-	-	+	-	o	o	o
cultural heritage	o	o	o	o	o	o	o
recreation/landscape	-	o	+	-	-	+	+
public health	-	o	+	o	+	o ?	+ ?
Development	-	o	+	o	o	o	+
water use competition	-	o	+	o	o	o ?	+ ?
land use competition	-	o	o	o	o	o	+
fossil resources	o	-	o	-	o	o	-
Compatibility with							
environment regulations	-	o	+	o	o	o	o
land use plans	-	o	+	o	o	o	+
Water	-	o	+	o	- ?	o	+
Surface water							
water volumes (river)	o	o	+	o	-	o	o
water quality	o	o	+	o	+	o	o
impoundments	o	o	+	o	+	o	o
Ground water							
water table rise	o	o	o	o	o	- ?	?
groundwater recharge	o	o	o	o	-	+	+
groundwater quality	-	o	+	o	o	o	o
Soil	-	-	+	-	o	o	+
Land use	o	-	o	-	o	-	+
Erosion	o	-	o	-	o	o	o
Physical properties	o ?	o	o	o	o	o	+
Bio-chemical fertility	-	o	+	o	o	o	+
Contamination	-	-	+	-	o	o	+ ?
Climate/Air	-	-	o	-	o	o	o
air pollution	-	-	- ?	-	o	o ?	o ?
nuisance	-	-	+	-	+	o	+
air circulation	o	o	o	o	o	o	o
Fauna/Flora	-	o	o	-	o	o	o
protected areas	-	o	+	o	o	o	o
endangered species	o	o	o	o	o	o	o
floral diversity	?	o	o ?	-	-	o	o +
segmentation of animal habitats	o	o	o	-	o	o	o
biological imbalances	-	o	+	o	+	o ?	+ ?

+ improvement
o no or insignificant change
- deterioration
? unclear

Rapid Appraisal with Expert Consultations

SAMPLE PRESENTATIONS OF ENVIRONMENTAL APPRAISALS

Example 9: Environmental audit of two German farms (after Eckert/Breitschuh 1994)

Method: KUL-method (critical limits of environmental impacts in agriculture)

1. Identification of sensitive natural resources (environmental components) that are used on farms: fertility, soil protection, plant protection, biodiversity and landscape variability, energy balance, livestock keeping
2. Setting of indicators for components, e.g. N-balance, soil compaction, stocking rate
3. Determination of quantifiable conditions where these indicators are at optimum (or no degradation exists) and setting of threshold limits where degradation or otherwise unacceptable conditions will occur. Locally accepted ecological standards, derived from environmental quality goals, need to be developed for all indicators.
4. Monitoring of indicators during farm operation. The example shows observations over two years from two farms with specified extensive and intensive husbandry methods: an eco-farm and a farm applying partially modern methods of integrated plant protection, targeted fertilisation, conservation farming methods, etc.

Figure 1:
Critical environmental balance - agriculture

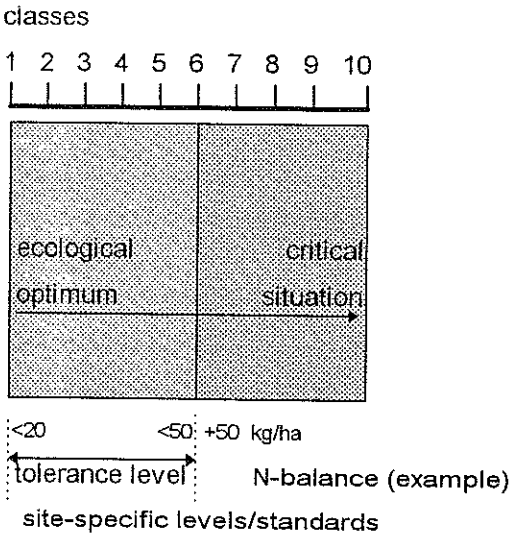
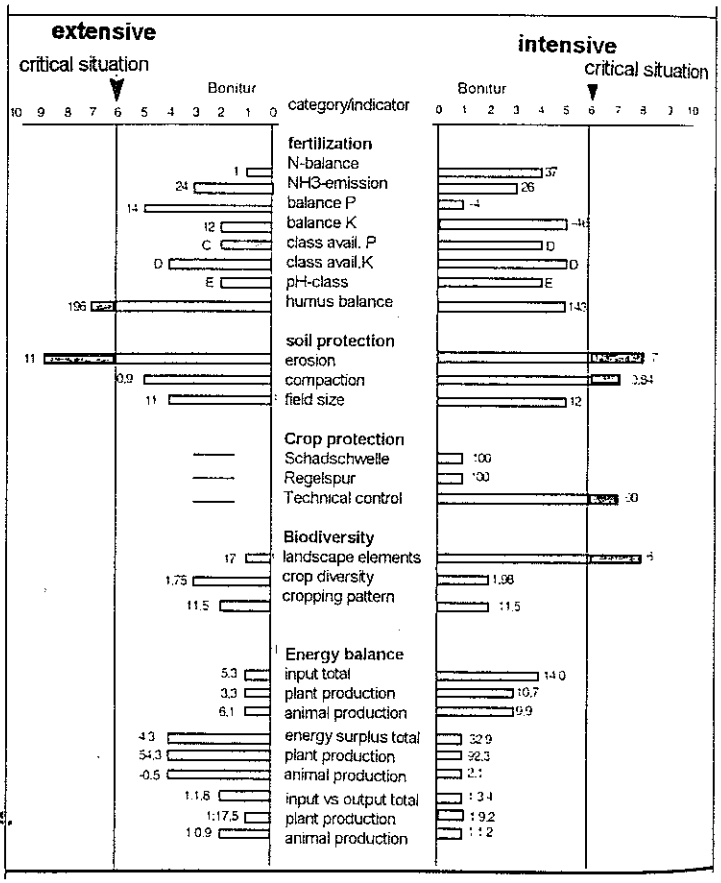


Figure 2:
Environmental audit of 2 farms: extensive vs intensive farming



Environmental categories & their indicators

nutrient balance e.g. N-, P-, K-balance, pH, humus

use of pesticides e.g. total application rate, eco-toxicity

soil degradation e.g. erosion, compaction

landscape & species diversity habitats important for biodiversity, connectivity of habitats, crop & land use divers.

healthy livestock systems.....

animal waste control.....

farm energy balance energy input (fuel etc.), biomass production, energy surplus, ratio input vs output

Example 10: Multi-Criteria Analysis. Flood control Compartmentalisation Pilot Project (CPP), Tangail, Bangladesh.

from: FAP 20. 1993

MULTI-CRITERIA ANALYSIS

Data Type	Variable	Unit	OPTION 2 A
1. Economic	EIRR	%	15.7
	NPV	m.Tk	56.6
	Benefit/Cost Ratio		1.18
2. Quantitative			
2.1 Construction: (financial values)	Investment	m.Tk	280.6
	Time for completion	years	3
	Labour intensity	man/d/a	3,311
	Foreign exchange as % of total investment	%	37.6
2.2 Operation & Maintenance	Total cost	m.Tk/a	13.2
	Labour intensity	man/d/a	232.0
	Labour cost as per cent of total O&M costs	%	82.8
2.3 Agriculture	Value added	m.Tk/a	24,450
	Employment generation	man/d/a	371,637
	Diversification 1)	ratio	1.17
	Draught power requirements	pair/d/a	43,168
	Ratio HYV/local varieties in rice production	ratio	4.6
2.4 Fishery	Capture fish	Tons/a	-3
	Aquaculture	Tons/a	0
2.5 Damage Prevention	Physical infrastructure	m.Tk/a 2)	3.5
	Private property	m.Tk/a 2)	0.5
	Crop production	m.Tk/a 2)	2.9
2.6 Mitigation Measures	Adjacent areas (financial)	m.Tk	7.1
	Non-structural (financal)	m.Tk	9.5

1) rice crops to non-rice crops
2) on compartment

Working Aid 12-10 cont.

Data Type	Variable	Scale - 5 4 3 2 1 0 1 2 3 4 5 +
3. Qualitative		
3.1 Natural resources and environment	Flood plain nutrient recharge	
	Flood plain sand deposits	
	Waterway sedimentation 1)	
	Groundwater availability	
	Surface water quantity	
	Surface water quality	
	* Sirajganj town	
	* rural areas	
	Flora diversity	
	Fauna diversity	
	Wetland protection	
	Common ressourc. availability	
3.2 Agriculture	Dependency on agricultural services	
	Seasonal distribution of labour	
	Livestock	
	Soil fertility	
	Homestead and gardening	
3.3 Fisheries	Nutritional impact on subsistence level	
	Fish recruitment	
3.4 Women	Additional work load	
	Social mobility	
3.5 Communicat.	Road transport	
	Internal navigation	
3.6 Health	Nutrition	
	Domestic water supply	
	Vector-borne diseases	
	Water based diseases	
3.8 Social issues	Social conflict	
	Income distribution	
3.9 Others	Flood retention	
	Cultural heritage	

Introduction to Multi-Criteria-Analysis (MCA): steps & determination of criteria of a hierarchical objective system.

adapted from de Graaf (1995)

MCA is useful if you have to choose between different options and many objectives in project design, and if the variables have different dimensions. MCA methods can also include complex weighting matrices, aggregation and numeric ranking. The tables in WA 12-10 (Example X. CPP Bangladesh) do not aggregate the different options but use a descriptive form which explains the tables presented here.

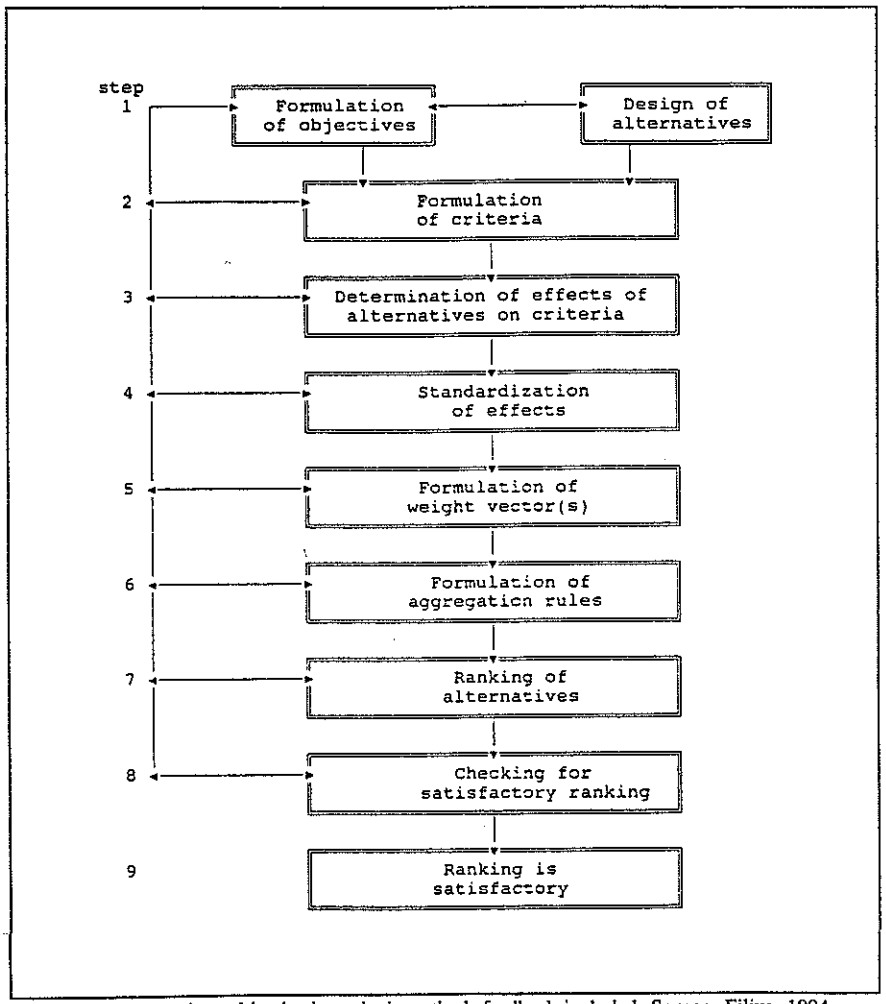


Figure 12.2 Steps in multi-criteria analysis method; feedback included. Source: Filius, 1994.

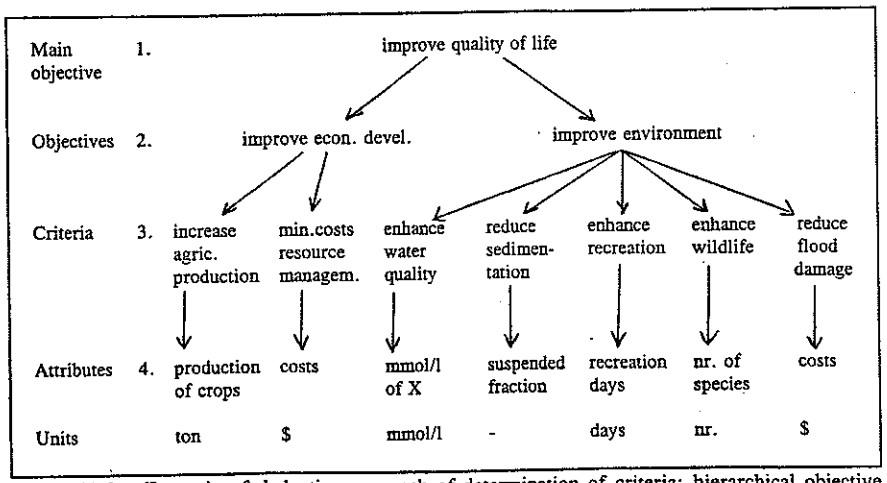


Figure 12.3 Example of deductive approach of determination of criteria; hierarchical objective system.

SAMPLE TABLE OF CONTENTS OF EIA-STUDIES

13.1 Rapid Environmental Appraisal

Scoping result	Rapid overall appraisal required
Timeframe	0.5 to 1 month (without special field surveys)
Staffing	Environmental planner or land & water specialist with experience in agricultural development, irrigation, soils, hydrology and ecology
Limitations	Without in-depth analysis of ecological, agro-economic and socio-cultural aspects; information is mainly derived from consultation of national or local specialists or 1-day workshop with specialists
Bounding/Scoping	Limitation to important environmental components, e.g. impact of river water abstraction on downstream flow; impact on land use pattern and practices and potential land use conflicts, impacts on public health risks
Report	approx. 20-40 pages report plus technical Annexes

SAMPLE TABLE OF CONTENT OF EIA-STUDIES

13.2	Semi-detailed EIA-study
Scoping result	Rapid overall appraisal with special analysis of selected important and sensitive environmental components (optional)
Time Frame	2-3 months; plus 3-6 months special baseline surveys, if required
Personnel	Land & water management or environmental planner, if required special inputs from: land use planning, hydrology, landscape ecology/biology, soil science, agronomy, agro-sociology, water engineering
Staffing	2 to 4 environmental specialists-months if special surveys are required: additional 3 to 10 specialist-months
Report	Non-technical executive summary approx. 5 pages. Technical Report about 100 pages, plus Technical Annex

EXECUTIVE SUMMARY

1. Background
2. The Rapid Environmental Appraisal
3. Scope, Objectives and Methodology
4. Framework Conditions for Environmentally Sound Development
5. Prognosis of Environmental Effects
6. Holistic Environmental Appraisal
7. Concepts for Environmentally Sound Development (at project level)
8. Recommendations for Environmental Management (at project level)

MAIN REPORT

1 Scope and Objective of Environmental Appraisal

1.1 Background
1.2 Scope of the Rapid Environmental Appraisal
1.3 Appraisal objectives and approach
1.4 Availability of environmental data
1.5 Appraisal team
1.6 Local people's perceptions and participation in planning

2 Description of Framework Conditions for Development

2.1 Human population
2.2 People and lifestyles
2.3 Administration, development strategies and programmes
2.4 Regional environmental model
2.5 Assessment of framework conditions for environmental management

3 Nature and Characteristics of Development Activities

3.1 Location and size of development activities
3.2 Kind and type of development activities
3.3 Development scenarios and alternatives
3.4 Integration into existing land use and other development plans

4 Environmental Profile of the Area

4.1 Bio-physical resources: water and soil resources, climate and air, eco-biological resources
4.2 Competition over resources for economic development: land and water resources uses; natural and cottage industry; use of non-renewable resources
4.3 Quality-of-Life values: public health hazards, scenery, cultural heritage values, socio-economic welfare in the village sector
4.4 Summary of major issues of environmental concern
Perceptions of the local people; sensitive environmental resources and their current impairments; environmental risks

5 Potentially Significant Impacts

5.1 Conceptual impact analysis: cause-effect networks
5.2 Potential impacts on sensitive environmental resources
5.3 Limitations of impact analysis

6 Prognosis of Important Environmental Changes

6.1 Impact analysis: Bio-physical resources: water, soils, ecology; land use and conflicts over economic development; quality of life values: public health, scenery, cultural heritage, socio-economic welfare
6.2 Management options for impact mitigation and compensation
6.3 Summary on significant risks in development and resources uses

7 Appraisal of Environmental Impacts

7.1 Environmental appraisal criteria
7.2 Area extent and sensitivity or uniqueness of affected resources
7.3 Significance assessment of impacts
7.4 Holistic appraisal of environmental impacts
7.5 Technical and managerial alternatives for development
7.6 Environmental risk reduction achieved by project activities

8 Recommendations for Environmental Management

8.1 Concepts for environmentally sound development
Local environmental quality goals; environmental indicators/ standards
8.2 Mitigating measures and environmental safeguards
Planning standards; "Best Management Practices" for crop production; recommendations: nature conservation/ risk management/ compensation
8.3 Environmental monitoring and control

SAMPLE TABLE OF CONTENT OF EIA-STUDIES

13.3	Detailed EIA
Scoping result	In-depth appraisal with special baseline surveys and analysis of several important and sensitive environmental components (optional)
Time Frame	6-18 months; plus several months special baseline surveys
Personnel	Land & Water Management or Environmental Planner, plus sector specialists, e.g. Land Use Planning, Hydrology, Soils, Landscape Ecology/Biology, Agronomy, Agro-Sociology, Irrigation and Water Engineering. Archaeology, Forestry. GIS and Geography.
Staffing	Some 12 environmental specialists-months plus 6 to 20 specialist-months (variable, depending on baseline surveys)
Report	Non-technical executive summary approx. 5 to 10 pages, Technical Report about 150 pages, plus Technical EIA-Annex and Baseline Surveys Documentation

The following Table of Contents is an extract of an EIA for the flood control project: Compartmentalization Pilot Project CPP Sirjganj in Bangladesh (FAP 20.1993). The CPP aims to provide shelter for some 100 000 people during high floods and to protect some 20 000 ha of arable land from untimely and prolonged floods, promoting crop diversification, triple-cropping and dry-season irrigation.

4.2 Land resources
- 4.2.1 Physiographic features
- 4.2.2 Agro-climatic zones
- 4.2.3 Soils

4.3 Eco-biological resources
- 4.3.1 River and floodplain ecosystems
- 4.3.2 Biological imbalances (terrestrial ecosystems)

4.4 Resource uses and competition for development
- 4.4.1 Water uses
- 4.4.2 Land uses
- 4.4.3 Competition over land resources
- 4.4.4 Use of energy and non-renewable resources

4.5 Public health
- 4.5.1 Major public health issues
- 4.5.2 Important Water-Related Diseases
- 4.5.3 Communicable vector-borne diseases
- 4.5.4 Need for integrated water management planning

4.6 Other issues of Quality-of-Life values
- 4.6.1 Cultural heritage sites
- 4.6.2 Socio-economic welfare

4.7 Environmental issues in Sirajganj Town

5 Summary of Major Issues of Environmental Concern

5.1 Perceptions of the local people and other interested parties
5.2 Sensitive environmental resources and their existing impairments
5.3 Environmental risks in the planning areas

6 Potentially Significant Impacts from Flood Control and Drainage Works

6.1 Existing status: impacts from existing embankments
6.2 Conceptual impact analysis (to define "important environmental components")
6.3 Project impact matrix (this chapter is based on the findings of the Technical Annex and other technical reports)
6.4 External and strategic impacts
6.5 Impacts addressed in other project reports (Fisheries, Social, Economic)
6.6 Limitations of impact analysis
- 6.6.1 Complexity of impact analysis
- 6.6.2 The magnitude of impacts
- 6.6.3 Shortcomings in impact quantification
- 6.6.4 The major focus: environmental management

7 Recommendations for Environmental Management

7.1 Risk assessment in the planning areas
7.2 Environmental considerations in planning and operation

8. Future Work Programme

8.1 Participation in project planning
8.2 Environmental Management Plan (see Working Aid 13.4)

Technical Annex: Baseline Data and Surveys: wetlands & homestead vegetation survey, land use survey, public health survey, fisheries survey, needs analysis.

SAMPLE TABLE OF CONTENT OF EIA-STUDIES

13.4	Environmental Management Plan (EMP)
Time Frame	2 - 3 months planning 3 years or more implementing the plan, monitoring and follow up
Staffing	2 to 4 environmental specialist-months for the EMP study; backstopping during implementation by a land & water management specialist or environmental planner plus specialists inputs
Report	Non-technical executive summary approx. 5 pages, Technical Report about 100 pages, additional technical Annexes

0 Executive Summary (separate volume)

1 Introduction (project description, EMP scope, review of EIA study findings)

2 Environmental Framework Conditions

- 2.1 Environmental policy and legislation
- 2.2 Institutional framework
- 2.3 National and sector strategies for sustainable development

3 Environmental Protection Plan

- 3.1 Impact management through anticipatory planning
  - 3.1.1 Environmental targets for structural interventions
  - 3.1.2 Management for sustainable crop production
  - 3.1.3 Management of fisheries impacts
- 3.2 Mitigation plan
- 3.3 Contingency plan
- 3.4 Compensation plan for residual impacts
- 3.5 Other resource intervention plans (enhancing sustainable land use)

4 Environmental Monitoring Plan

- 4.1 Environmental impact monitoring
- 4.2 Compliance monitoring (national safety and pollution control standards)

5 Participation Programme for Affected and Interested Parties

6 Implementing the EMP

- 6.1 Institutional cooperation and capacity-building
- 6.2 Staffing and budget (implementation costs)
- 6.3 Implementation schedule
- 6.4 Reporting and accountability

Annex: Fact sheets on EMP activities

Terms of Reference for EIA

Source: Environmental Assessment Resourcebook, Vol II. The World Bank 1991

ANNEX 1-3

Sample Terms of Reference (TOR) for Environmental Assessment (Name of Project Category)

Note: Comments in **[brackets and bold face type]** in this TOR Outline indicate where content may have been included, excluded or modified in the project-specific sample TORs (see Annex 1-3A). When combined, the TOR Outline and the project-specific sample TORs provide comprehensive guidance for TOR preparation. Paragraph numbers in each text correspond for ease of reference.

1. Introduction. This section should state the purpose of the terms of reference, identify the development project to be assessed, and explain the executing arrangements for the environmental assessment.

2. Background Information. Pertinent background for potential parties who may conduct the environmental assessment, whether they are consultants or government agencies, would include a brief description of the major components of the proposed project, a statement of the need for it and the objectives it is intended to meet, the implementing agency, a brief history of the project (including alternatives considered), its current status and timetable, and the identities of any associated projects. If there are other projects in progress or planned within the region which may compete for the same resources, they should also be identified here.

3. Objectives. This section will summarize the general scope of the environmental assessment and discuss its timing in relation to the processes of project preparation, design, and execution.

4. Environmental Assessment Requirements. This paragraph should identify any regulations and guidelines which will govern the conduct of the assessment or specify the content of its report. They may include any or all of the following:

   - World Bank Operational Directive 4.00, Annex A: "Environmental Assessment," and other pertinent ODs, OMSs, OPNs, and Guidelines;
   - national laws and/or regulations on environmental reviews and impact assessments;
   - regional, provincial or communal environmental assessment regulations; and
   - environmental assessment regulations of any other financing organizations involved in the project.

5. Study Area. Specify the boundaries of the study area for the assessment (e.g., water catchment, airshed). If there are any adjacent or remote areas which should be considered with respect to

6. Scope of Work. In some cases, the tasks to be carried out by a consultant will be known with sufficient certainty to be specified completely in the terms of reference. In other cases, information deficiencies need to be alleviated or specialized field studies or modelling activities performed to assess impacts, and the consultant will be asked to define particular tasks in more detail for contracting agency review and approval. Task 4 in the Scope of Work is an example of the latter situation.

7. Task 1. Description of the Proposed Project. Provide a brief description of the relevant parts of the project, using maps (at appropriate scale) where necessary, and including the following information: location; general layout; size, capacity, etc.; pre-construction activities; construction activities; schedule; staffing and support; facilities and services; operation and maintenance activities; required off-site investments; and life span.

[Note: there may be particular types of information appropriate in the description of the project category you are concerned with. Please specify them here.]

8. Task 2. Description of the Environment. Assemble, evaluate and present baseline data on the relevant environmental characteristics of the study area. Include information on any changes anticipated before the roject commences. **[Annotate or modify the lists below to show the critical information for this project category, or that which is irrelevant to it. You should particularly avoid compiling irrelevant data.]**

(a) Physical environment: geology; topography; soils; climate and meteorology; ambient air quality; surface and groundwater hydrology; coastal and oceanic parameters; existing sources of air emissions; existing water pollution discharges; and receiving water quality.

(b) Biological environment: flora; fauna; rare or endangered species; sensitive habitats, including parks or preserves, significant natural sites, etc.; species of commercial importance; and species with potential to become nuisances, vectors or dangerous.

(c) Socio-cultural environment (include both present and projected where appropriate): population; land use; planned development activities; community structure; employment; distribution of income, goods and services; recreation; public health; cultural properties; tribal peoples; and customs, aspirations and attitudes.

9. Task 3. Legislative and Regulatory Considerations. Describe the pertinent regulations and standards governing environmental quality, health and safety, protection of sensitive areas, protection of endangered species, siting, land use control, etc., at international, national, regional and local levels (The TOR should specify those that are known and require the consultant to investigate for others.)

10. Task 4. Determination of the Potential Impacts of the Proposed Project. In this analysis, distinguish between significant positive and negative impacts, direct and indirect impacts, and immediate and long-term impacts. Identify impacts which are unavoidable or irreversible. Wherever possible, describe impacts quantitatively, in terms of environmental costs and benefits.

Assign economic values when feasible. Characterize the extent and quality of available data, explaining significant information deficiencies and any uncertainties associated with predictions of impact. If possible, give the TOR for studies to obtain the missing information. **[Identify the types of special studies likely to be needed for this project category.]**

11. Task 5. Analysis of Alternatives to the Proposed Project. Describe alternatives that were examined in the course of developing the proposed project and identify other alternatives which would achieve the same objectives. The concept of alternatives extends to siting, design, technology selection, construction techniques and phasing, and operating and maintenance procedures. Compare alternatives in terms of potential environmental impacts; capital and operating costs; suitability under local conditions; and institutional, training, and monitoring requirements. When describing the impacts, indicate which are irreversible or unavoidable and which can be mitigated. To the extent possible, quantify the costs and benefits of each alternative, incorporating the estimated costs of any associated mitigating measures. Include the alternative of not constructing the project, in order to demonstrate environmental conditions without it.

12. Task 6. Development of Management Plan to Mitigate Negative Impacts. Recommend feasible and cost-effective measures to prevent or reduce significant negative impacts to acceptable levels. Estimate the impacts and costs of those measures, and of the institutional and training requirements to implement them. Consider compensation to affected parties for impacts which cannot be mitigated. Prepare a management plan including proposed work programs, budget estimates, schedules, staffing and training requirements, and other necessary support services to implement the mitigating measures.

13. Task 7. Identification of Institutional Needs to Implement Environmental Assessment Recommendations. Review the authority and capability of institutions at local, provincial/regional, and national levels and recommend steps to strengthen or expand them so that the management and monitoring plans in the environmental assessment can be implemented. The recommendations may extend to new laws and regulations, new agencies or agency functions, intersectoral arrangements, management procedures and training, staffing, operation and maintenance training, budgeting, and financial support.

14. Task 8. Development of a Monitoring Plan. Prepare a detailed plan to monitor the implementation of mitigating measures and the impacts of the project during construction and operation. Include in the plan an estimate of capital and operating costs and a description of other inputs (such as training and institutional strengthening) needed to carry it out.

15. Task 9. Assist in Inter-Agency Coordination and Public/NGO Participation. Assist in coordinating the environmental assessment with other government agencies, in obtaining the views of local NGO's and affected groups, and in keeping records of meetings and other activities, communications, and comments and their disposition. (The TOR should specify the types of activities; e.g., interagency scoping session, environmental briefings for project staff and interagency committees, support to environmental advisory panels, public forum.)

16. Report. The environmental assessment report should be concise and limited to significant environmental issues. The main text should focus on findings, conclusions and recommended actions, supported by summaries of the data collected and citations for any references used in interpreting those data. Detailed or uninterpreted data are not appropriate in the main text and should be presented in appendices or a separate volume. Unpublished documents used in the assessment may not be readily available and should also be assembled in an appendix. Organize the environmental assessment report according to the outline below.

- Executive Summary
- Policy, Legal and Administrative Framework
- Description of the Proposed Project
- Description of the Environment
- Significant Environmental Impacts
- Analysis of Alternatives
- Mitigation Management Plan
- Environmental Management and Training
- Monitoring Plan
- Inter-Agency and Public/NGO Involvement
- List of References
- Appendices:
  - List of Environmental Assessment Preparers
  - Records of Inter-Agency and Public/NGO Communications
  - Data and Unpublished Reference Documents

18. Schedule. Specify dates for progress reviews, interim and final reports, and other significant events.

19. Other Information. Include here lists of data sources, project background reports and studies, relevant publications, and other items to which the consultant's attention should be directed.

ANNEX 8-7

Sample Terms of Reference (TOR)
An Environmental Assessment of Irrigation and Drainage

Note: Paragraph numbers correspond to those in the Sample Terms of Reference (TOR) outline in Annex 1-3; additional paragraphs are not numbered

7. Task 1. Description of the Proposed Project: general design and extent of irrigation and drainage works (specifications of dam and reservoir, size of command area, etc.); size of catchment area; operation and maintenance of irrigation works.

8. Task 2. Description of the Environment.

(c) Socio-economic environment: land use (including current crops and cropping patterns); land tenure and land titling; present water supply and water uses (including current distribution of water resources if irrigation systems already exist in area); control over allocation of resource use rights.

10. Task 4. Determination of the Potential Impacts of and Impacts on the Proposed Project. Potential impacts to be assessed include:

(a) Project Location: resettlement of people; loss of forest land; loss of agricultural land (cropping and grazing); impact on flora and fauna; impact on historic and cultural sites; effects on water resources outside and inside command area.

(b) Project Design: disruption of hydrology; drainage problems; design of dams and other structures; crossings for people and animals.

(c) Construction Works: soil erosion; construction spoils (disposal of); sanitary conditions and health risks associated with construction camp and workers coming into area; social and cultural conflicts between inported workers and local people.

(d) Project Operation: pollution by agrochemicals; impacts on soils (waterlogging, salinization, etc.); changes in groundwater levels inside and outside command area; changes in surface water quality and risks of eutrophication; incidence of water-borne and water-related diseases.

17. Consulting Team. Members of the team should consist of people with the following specializations: environmental impact assessment (with extensive experience in irrigation); rural sociology.

Depending on the baseline data needed and the mitigating measures proposed, the team may also include some of the following disciplines: agronomy; hydrology; terrestrial ecology (plant, forestry and wildlife as appropriate to the ecology of the irrigation site and adjacent areas); aquatic ecology and fisheries; soil science.

ANNEX 8-2

Sample Terms of Reference (TOR)
An Environmental Assessment of Dams and Reservoirs

Note: Paragraph numbers correspond to those in the Sample Terms of Reference Outline (TOR) in Annex 1-3; additional paragraphs are not numbered

7. Task 1. Description of the Proposed Project: general layout, size and capacity (dam and reservoir specifications, location of outlets, etc.), and life-span of the dam and reservoir.

8. Task 2. Description of the Environment. Assemble, evaluate and present baseline data on the relevant environmental characteristics of the study area, including watershed, site of the dam and reservoir and downstream areas, especially floodplain, and biological environment (particularly fish resources).

10. Task 4. Determination of the Potential Impacts of and Impacts on the Proposed Project. Potential impacts to be assessed include:

(a) Social and ecological effects of reservoir inundation (loss of agricultural, forestry and grazing land, population resettlement, effects on wildlife and wildlands, etc.).

(b) Effects on the hydrology and water quality of the river (and where relevant, the estuarine, coastal and marine resources).

(c) Effects on river fisheries and potential for creating a reservoir fisheries resource.

(d) Impacts of altering river flow regimes on the ecology of the floodplain, and the economic activities/land use on the floodplain (agriculture, livestock production, etc.).

(e) Impact of altering water supply on urban, industrial, and rural users.

(f) Potential environmental and social impacts by planned and unplanned (spontaneous) in-migration into the area.

(g) Potential for increased incidence of water-borne and water-related diseases.

(h) Impact on terrestrial and aquatic wildlife, by creation of the reservoir, disruption of migration routes, alteration of floodplain ecology, and population impacts.

(i) Effect of existing and predicted land use in the watershed on the functioning and longevity of the dam and reservoir.

17. Consulting Team. Members of the team should consist of people with the following specializations: environmental planning and management; hydrology; terrestrial ecology (plant ecology, forestry and wildlife); acquatic ecology and fisheries; watershed management; soil science and geology (where relevant); public health, particularly speciality in water borne and water-related diseases; rural sociology.

ANNEX 8-3

Sample Terms of Reference (TOR)
An Environmental Assessment of Flood Protection

Note: Paragraph numbers correspond to those in the Sample Terms of Reference (TOR) Outline in Annex 1-3; additional paragraphs are not numbered

Task 1. Description of the Proposed Project: scheme's general design, capacity and degree of protection for various flood levels.

Task 2. Description of the Environment. Assemble, evaluate and present baseline data on the environmental characteristics of the study area, including watershed areas, the sites of flood control structures and floodplain areas.

(a) Physical environment: surface and groundwater hydrology (annual peak discharge, recurrence intervals of various peak discharges, and peak stages for various discharges).

Task 4. Determination of the Potential Impacts of the Proposed Project. Particular attention should be paid to the following aspects:

(a) Effects of the flood control dam: direct environmental impacts of the dam construction and reservoir inundation; effects on fisheries resource (creation of a reservoir fisheries, loss of downstream fisheries); effects on water quantity and quality; effects on floodplain ecology.

(b) Effects of flood control structures and measures (e.g., levees, dikes and channelization measures) on: aquatic ecology, particularly fish resources; hydrology, including groundwater recharge, and water quality; plant and animal ecology of the floodplain.

(c) Socio-economic impacts on populations in inundation area and downstream (floodplain dwellers, urban population, etc.) through: land use changes; impacts on water-related economic activities (e.g., fisheries, transportation, etc.); health effects (e.g., increased incidence of water-borne and water-related diseases).

Consulting Team. Members of the team should consist of people with the following specializations: environmental planning and management; fisheries and/or aquatic ecology; hydrology, watershed management and forestry (for upstream effects); terrestrial ecology and wildlife ecology, etc. (for impacts in the inundation area and on the floodplain); rural sociology.

Reviewing the Quality of EIA-Studies

modified after Lee and Colley, EIA Centre University of Manchester, 1990

A good EIA study contains only that environmental information which is sufficient for the proper consideration of the project-specific application.

The review of an EIA study should cover three **main questions**:

1. Is the EIA well focused on the key questions which should be answered to make a decision about the proposed project?
2. Is the EIA scientifically and technically sound?
3. Is the EIA clearly organised and presented so that it can be understood?

A quality check has three components: **methodological, practical** and **procedural** criteria. It is essential that the methods used in deriving the results can be evaluated. **Important requirements** for this are:

1. Transparency: an EIA should present all its assumptions (including scoping/ bounding) and justify the methodology of analysis, sector-specific evaluation and the overall EIA-assessment it has used, especially aggregation/valuation methods;
2. Reproducibility; it should be possible to reconstruct the overall assessment;
3. Fairness: alternative development options (e.g. regarding site location, technical options, organisation and management) have to be selected fairly so as to avoid self-fulfilling results;
4. Data sources: sources used (also the methodology used in baseline surveys) should be clearly stated so that their reliability and accuracy can be checked.

Review Procedure

An elaborate procedure for a detailed EIA study is shown in the following. For semi-detailed or rapid appraisals, this procedure may be modified and adapted to the scope of the EIA study. To conduct a detailed review undertake the following steps:

1. Read all of the general advice for reviewers (see above).
2. Read through the List of Review Topics (areas 1 to 4, see below).
3. Read the overall assessment of the EIA study quickly, noting the layout and the whereabouts of essential information.
4. Read the first Review Topic (e.g. area 1 and its subcomponents). Remember that the review sub-components refer to actions which must be undertaken in order that taks described by the area may be performed fully and well.
5. Work through all review areas and their sub-components referring closely to the EIA overall assessment
6. Decide which assessment ranking is appropriate and record it on the Review Collation Sheet (see below).
7. When all review areas have been assessed the EIA as a whole can be assigned an assessment symbol. The overall judgement should be supplemented with a brief synopsis of the EIA strengths and weaknesses and a consideration of whether it meets minimum requirements.

List of Review Topics

There are four areas (and their subcomponents) for review:

1. Description of the development, the local environment and the baseline conditions;
2. Identification and evaluation of key impacts;
3. Alternatives and mitigation of impacts;
4. Communication of results.

1. Description of the development, local environment & baseline conditions

The objectives of the development should be described, as should the physical characteristics (structural or engineering works, agronomic and land husbandry practices), scale, and design.

1. The nature and quantities of materials (and energy) needed during both construction and operational phases should be stated.
2. On-site land requirements of the development should be described, including the duration of each land use and the land taken up by the development, and its location shown on a map. The estimated duration of both the construction and operation phase should be given. The number of workers entering the development site should be estimated.
3. The types and quantities of residual and waste created and energy needed during both construction and operational phases should be estimated, and the proposed handling/treatment and disposal routes to the environment described, and ranges of confidence limits given where possible.
4. The affected environment should be defined broadly enough to include any potentially significant effects away from the immediate project site. These may be caused by, e.g. the dispersion of pollutants, infrastructure requirements, traffic, abstraction of water, or flood and drainage control. The likely areal extent of the affected environment should be described and delineated on a map.
5. A description of the affected environment as it is currently, and as it is be expected to develop if the project were not to proceed, should be presented. The important components of the affected environments should be identified and described; the methods and investigations (e.g. baseline surveys) should be disclosed and appropriate to the size and complexity of the EIA-task; existing data sources should be utilised and these should include national and local authority records, research studies, and reports carried out by, or on behalf of, conservation agencies and special interest groups; local land use plans should be consulted to assist in the determination of the baseline conditions, i.e. the probable future state of the environment, in the absence of the project, taking into account natural fluctuations and human activities.

2. Identification and evaluation of key impacts

Potential impacts of the project on the environment should be investigated and described. Impacts should be defined broadly to cover all potential effects on the environment and should be determined as predicted deviation from the baseline state.

1. Impacts should not confined to immediate effects. Consideration should be given to effects which may be positive or negative, cumulative, short- or long-term, permanent or temporary, direct or indirect, and reversible or irreversible.
2. The above types of impacts should be investigated and described, especially with regard to identifying effects on people, flora and fauna, soil, water air, climate, landscape, material assets, cultural heritage, or interactions between these.
3. Considerations should not be limited to events which will occur under design operating conditions. Where appropriate, impacts which might arise from non-standard operating conditions, due to accidents or misuse, should also be described (risk assessment).
4. Identification of impacts: a systematic approach should be used, e.g. project specific checklists, matrices, cause-effect networks, panels of experts, extensive consultations.
5. Scoping: not all impacts should be studied in equal depth. Key impacts should be identified and the main investigations centred on these. The scoping methods should be described and their use justified.
6. Ascertain and record the opinions and concerns of the people immediately affected by the project (farmers, other land or water users), relevant governmental agencies, special interest groups (or stakeholders), and the general public. Public meetings, seminars, discussion groups, surveys, etc. may facilitate this.
7. Prediction of impact magnitude: the likely impacts of the project on the environment should be quantified wherever possible. The methods used to predict impact magnitude should be described and be appropriate to the size and importance of the projected disturbance/effect. Wherever possible, estimated of impacts should be in measurable quantities with ranges and confidence limits as appropriate. Qualitative descriptions ("insignificant"), where necessary, should be defined as fully as possible.
8. Assessment of impact significance: expected significance that the projected impacts will have for society and ecology should be estimated. The sources of quality standards plus the rationale, assumptions and value judgements used in assessing significance should be fully described. Appropriate national and international quality standards should be used where available. Account should be taken, in conjunction with national and local societal values, of the magnitude, location, duration and irreversibility of the impact. Existence of opposing or contrary opinions to the choice of standards and value systems should be acknowledged.
9. The significance of all those impacts which remain after mitigation should be described.

3. Alternatives and mitigation

Alternatives to the proposed project as described should have been considered. These should be outlined, the environmental implications of each presented, and the reasons for their rejection briefly discussed. Alternatives may be technical or managerial options.

1. Alternative sites should have been considered where these are appropriate and available to the developer/land users. The main environmental advantages and disadvantages of each of these should be discussed and the reasons for the final choice given.
2. Where available, alternative agricultural production systems or land use types, choice of agricultural production technology (e.g. land husbandry, agronomic practices) and options for water resources and infrastructure development should have been considered at an early stage of project planning, and the environmental implications of each of these investigated and assessed.
3. All significant adverse impacts should be considered for mitigation (or compensation) and specific mitigation measures should be put forward. Any residual or unmitigated impacts should be indicated and justification offered. Mitigation measures should include modification of the project, compensation and the provision of alternative facilities as well as environmental controls (e.g. pollution control).
4. Evidence should be presented to show that proposed measures will be effective. The developer/land users should be committed to, and capable of, carrying out the mitigation measures and should present detailed implementation plans.
5. Where uncertainty exists over impact magnitude and effectiveness of mitigation, monitoring programs should be proposed to enable subsequent adjustment of mitigation measures and project operation.

4. Communication of results

The layout of the EIA study and its executive summary should enable the reader to find and to assimilate data easily and quickly. All sources of data should be acknowledged.

1. Information should be arranged logically, using the sample table of contents (see Working Aid 13) or equivalent standards.
2. Unless the chapters of the main report are very short, there should be chapter summaries outlining the main findings of each phase of the EIA study.
3. There should be a non-technical executive summary which presents information that it is accessible to the non-specialists. Technical terms, lists of data and detailed explanations of scientific reasoning should be avoided. The summary should be comprehensive, containing at least a brief description of the project, the environmental setting, an account of the main mitigation measures, and a description of any remaining or residual impacts. A brief explanation of the method and an indication of the confidence should be included.
4. Data presented in the appendices should be discussed in the main body of the technical text.
5. Information should be presented without bias and receive the emphasis appropriate to its importance in the context of the EIA study. Prominence should be given to potentially severe adverse impacts. Do not devote excessive space to impacts which have been well investigated or are beneficial.

Review Summary

Use the following symbols when completing the collation sheet below

Symbol	Explanation
A	generally well performed, no important tasks left incomplete
C	can be considered satisfactory despite omissions
E	not satisfactory, significant omissions or inadequacies
F	very unsatisfactory, important tasks poorly done or not attempted
NA	not applicable

Collation Sheet (numbers refer to review areas and their subcomponents)

1.....	2.....	3.....	4.....
1.1.....	2.1.....	3.1.....	4.1.....
1.2.....	2.2.....	3.2.....	4.2.....
1.3.....	2.3.....	3.3.....	4.3.....
1.4.....	2.4.....	3.4.....	4.4.....
1.5.....	2.5.....	3.5.....	4.5.....
	2.6.....		
	2.7.....		
	2.8.....		
	2.9.....		

Remarks: .....

.....

.....

.....

.....

Broad compliance .....

ENVIRONMENTAL LAWS AND REGULATIONS FOR AGRICULTURE

The following **legal and regulatory instruments** may exist in order to promote environmentally sound development:

1. Policy and economic instruments (national or international): pollution charges, (water) supply and consumption charges, eco-taxes, direct and indirect subsidies, product charges, direct and indirect incentives, tradable emission permits, deposit-refunding systems, cost-recovery fees, taxes or tariffs, etc. Many of these instruments apply to sustainable water management.

2. International (regional) guidelines, principles and standards: aiming at moral commitment, changes in attitude and behaviour, for example the FAO Code-of-Conduct to regulate agro-chemical uses, the Biodiversity Convention, the Ramsar Wetland Convention, inland water agreements such as for the Rhine River, the Zambesi River basin, and the Mekong River basin)

3. National laws and regulations (at national and state level): They are legally binding and contain effective measures for enforcement, e.g. water and air quality laws and regulations (ordinances, decrees), waste management laws.

4. National guidelines and standards in the form of environmental recommendations, e.g. best-management-practices, environmentally sound river training, or reservoir construction and maintenance.

5. Sector policies and regulations often define standards to comply with national laws, e.g. air and water quality standards, wastewater standards, health safety standards. Standards may vary considerably, despite efforts to develop and apply uniform national or international standards. The stringency of standards should stem from the feasibility of their implementation. Flexibility is required to consider site-specific conditions such as socio-economic status, level of technology, and state-of-the environment in a specific region. Different categories of standards may well be established for different components of the environment, e.g. very strict standards for protection of biodiversity and air pollution control, and more flexible ones for various uses of water.

Major laws applicable to agriculture and irrigation concern:

> water protection, air quality, waste management, soil protection, plant protection, fertilizer application, nature conservation, and health safety standards.

Other laws of interest concern:

> road planning, spatial or land use planing, environmental liability.

In the following, German environmental laws applicable to irrigated agriculture are reproduced as a guideline. The reader may identify the relevant environmental laws and regulations of the specific country for which the EIA is produced.

Environmental Regulations for the Farmer (Original in German: Umweltschutzvorschriften für den Land- und Forstwirt). AID Publication 1144. Bonn 1995.

Farmers are using natural resources (land, water, fauna/flora) and they are producing food. Thus, they are competing with other resource users and they are responsible for providing good food. Laws (acts, ordinances, decrees, technical instructions) govern farmer's activities to promote sustainable agricultural production.

⇒ Specific laws which farmers must comply with:

1. Plant Protection Act (Pflanzenschutzrecht)
2. Fertilizer Act (Düngemittelrecht)
3. Fodder Production Act (Futtermittelrecht)

⇒ General laws which are important for the farmer

4. Waste Avoidance and Waste Management Act (Abfallgesetz)
5. Waste Water Charges Act (Abwasserabgabenrecht)
6. Federal Emission Control Law (Immissionsschutzgesetz)
7. Environmental Impact Assessment Act (UVP-Gesetz)
8. Water Act (Wasserhaushaltsgesetz)
9. Federal Nature Conservation Act (Naturschutzrecht)
10. Forestry Act (Forstrecht)
11. Space Management (or Land Use) Act (Raumordnungsgesetz)

⇒ Other laws may also be relevant:

12. Drug Production and Trade Act (Arzneimittelrecht)
13. Food Production and Trade Act (Lebensmittelrecht)
14. Animal Carcass Disposal Act (Tierkörperbeseitigungsrecht)
15. Chemicals Act (Hazardous Substances Act; Chemikaliengesetz)
16. Civil Law (Bürgerliches Gesetz) and Criminal Law (Strafrecht)

The following governmental agencies are involved at the lower administrative levels:

- Council Administration (Gemeinde); Police
- District Administration, e.g. district nature conservation agency; district water agency (Kreisverwaltung, Landratsamt, untere Naturschutz- und untere Wasserbehörden)
- Sector-Specific District or State Administration (offices, agencies):
  - Land Development Agency (Bodenwirtschaftsamt, Amt für Flurneuordnung und Landentwicklung, Amt für Agrarstrukturentwicklung)
  - Plant Protection Office (Pflanzenschutzamt)
  - Forest Office (Forstamt)
  - Animal Production Office (Tierzuchtamt)
  - Vet Office and Health Office (Veterinäruntersuchungsamt/Gesundheitsamt)
  - Chemical Investigation Office (Chemisches Untersuchungsamt)
  - Agricultural Extension and Research Office (Landwirtschaftliche Untersuchungs- und Forschungsanstalt)
  - State Agency for Nature Protection (Landesanstalt /-amt für Umweltschutz)
  - Chamber of Agriculture (Landwirtschaftskammer)

Agricultural sector measures to control water pollution in Germany

In Germany, the agricultural sector is a major polluter of water bodies and, therefore, measures for reducing nutrient inputs into water bodies and for the safe use of pesticides are of major environmental concern. The Environmental State (Länder) Ministers Conferences States Working Group on Water (LAWA) recommended

- reduction of phosphorus inputs by reduction of erosion and surface runoff;
- reduction of nitrogen inputs into surface water through groundwater and drainage water.

Advisory services aim to promote:

- Run-off and soil erosion control:

  - on farmland and farm roads by soil cultivation/land husbandry methods which are site-specific: ecologically sound land consolidation, amelioration and layout of waterways; development of riparian belts, windbreaks and erosion-control strips; soils be covered during fallow periods; permanent set-aside of grassland; conversion of arable land into permanent grassland;

  - in water-protection areas (e.g. areas surrounding wells or reservoirs) special land husbandry regulations apply, e.g. prohibition of plowing/turning soil, restricted fertilizer and pesticide applications, fallow-grassland or land be set aside as grassland, afforestation. Compensation must be provided for any resulting economic hardship.

- Measures directly related to crop cultivation (site specific crop husbandry, crop rotation)
- Fertilisation appropriate to crop and site (soil, climate) requirements: notes and records should be the basis for calculating fertilizer amounts for the specific crop variety and crop rotation in question, soil tests
- Proper use of organic fertilisers (liquid manure and slurry), including adequate and functional storage capacity, proper treatment of organic wastes, better equipment for spreading slurry, inter-farm cooperation
- Extensification of production such as set-aside of marginal land, decommissioning of agricultural enterprises.

Various acts, ordinances and subsidy or compensation programmes at the federal (Bund), state (Länder) and council (Gemeinde) level regulate the execution of these recommendations (overview in English: Agricultural Sector Measures for Reducing Nutrient Inputs into Water Bodies. Federal Ministry for the Environment, Bonn, October 1993).